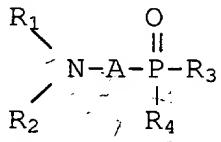
Patent Claims

1. Organophosphorus compounds of the general formula (I)

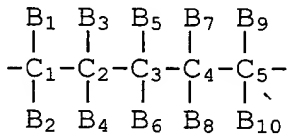


(I)

in which R_1 and R_2 are identical or different and are selected from the group which consists of hydrogen, substituted and unsubstituted C_{1-9} alkyl, substituted and unsubstituted hydroxy-C_{1-9}-alkyl, substituted and unsubstituted C_{1-9} alkenyl, substituted and unsubstituted C_{1-9} alkynyl, substituted and unsubstituted aryl, substituted and unsubstituted acyl, substituted and unsubstituted cycloalkyl, substituted and unsubstituted aralkyl, substituted and unsubstituted heterocyclic residue, halogen, OX_1 and OX_2,

wherein X_1 and X_2 may be identical or different and are selected from the group which consists of hydrogen, substituted and unsubstituted C_{1-9} alkyl, substituted and unsubstituted hydroxy-C_{1-9}-alkyl, substituted and unsubstituted C_{1-9} alkenyl, substituted and unsubstituted C_{1-9} alkynyl, substituted and unsubstituted aryl, substituted and unsubstituted acyl, substituted and unsubstituted cycloalkyl, substituted and unsubstituted aralkyl, substituted and unsubstituted heterocyclic residue,

in which A is of the following formula (II):



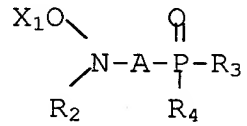
wherein one or more of the carbon atoms selected from the group C_3, C_4, C_5 together with their substituents may also be absent, and at least one substituent present in the range from B_1 to B_{10} is a C_{3-8}-cycloalkyl-(C_{0-9})-alkyl group, wherein both the C_{3-8} cycloalkyl group and the C_{0-9} alkyl group may comprise one or more double bonds and one or two carbon atoms of the cycloalkyl group may be replaced by nitrogen, oxygen or sulfur atoms, and wherein both the cycloalkyl group and the alkyl group may be substituted with hydroxy, halogen, amino, oxo groups with branched or unbranched C_{1-9} alkyl groups and C_{2-9} alkenyl groups, wherein the C_{1-9} alkyl groups and C_{2-9} alkenyl groups may be substituted with hydrogen, hydroxy, amino, halogen and oxo groups, and

the remaining substituents B_1 to B_{10} present are selected from the group which consists of hydrogen, hydroxy, halogen, amino groups, C_{1-26} alkyl residues, C_{1-26} alkoxy residues, C_{1-26}-alkoxy-C_{1-26}-alkyl residues or both substituents of a C atom together form an oxo group, wherein each C_{1-26} alkyl residue and each C_{1-26} alkoxy residue may be branched or unbranched and be saturated or unsaturated with one or more double bonds and may be substituted with hydroxy, amino, halogen and oxo groups,

in which R_3 and R_4 are identical or different and are selected from the group which consists of substituted and unsubstituted C_{1-26} alkyl, substituted and unsubstituted hydroxy-C_{1-26}-alkyl, substituted and unsubstituted aryl, substituted and unsubstituted acyl, substituted and unsubstituted cycloalkyl, substituted and unsubstituted aralkyl, substituted and unsubstituted C_{1-26} alkenyl, substituted and unsubstituted C_{1-26} alkynyl, substituted and unsubstituted cycloalkyl, substituted and unsubstituted heterocyclic residue, halogen, OX_3 and OX_4,

wherein X_3 and X_4 are identical or different and consist of hydrogen, substituted and unsubstituted C_{1-26} alkyl, substituted and unsubstituted hydroxy-C_{1-26}-alkyl, substituted and unsubstituted aryl, substituted and unsubstituted aralkyl, substituted and unsubstituted C_{1-26} alkenyl, substituted and unsubstituted C_{1-26} alkynyl, substituted and unsubstituted cycloalkyl, substituted and unsubstituted heterocyclic residue, a silyl, a cation of an organic and inorganic base, in particular a metal of main groups I, II or III of the periodic system, ammonium, substituted ammonium and ammonium compounds derived from ethylenediamine or amino acids,
and the pharmaceutically acceptable salts, esters thereof and salts of the esters.

2. Compound according to claim 1, characterised in that the organophosphorus compounds are of the formula (II)



(II)

wherein
wherein X_1 is hydrogen and R_2 an acyl residue, particularly preferably a formyl residue or acetyl residue, and R_3, R_4 and A have the same meaning ~~as in formula~~ (I).

3. Compound according to claim 1 or claim 2, characterised in that X_3 and X_4 are selected from the group which consists of OX_3 and OX_4, and X_3 and X_4 are selected from the group comprising hydrogen, a metal of main groups I, II or III of the periodic system,

ammonium, substituted ammonium, or ammonium compounds derived from ethylenediamine or amino acids.

4. Compound according to one of the preceding claims, characterised in that the carbon chain of A with the formula (II) consists of three carbon atoms C_1, C_2, C_3.

5. Compound according to one of claims 1 to 3, characterised in that B_1 and B_2 together or B_7 and B_8 together form an oxo group and the carbon chain in A consists of four carbon atoms C_1, C_2, C_3, C_4.

6. Compound according to one of claims 1 to 3, characterised in that the carbon chain of A with the formula (II) consists of four carbon atoms C_1, C_2, C_3, C_4 and B_7 or B_8 or both are a hydroxy group.

7. Compound according to one of claims 1 to 3, characterised in that the carbon chain preferably consists of 5 carbon atoms C_1, C_2, C_3, C_4, C_5, wherein B_1 and B_2 together form an oxo group and B_9 or B_{10} are a hydroxyl group or B_9 and B_{10} together also form an oxo group.

8. Compound according to claim 6 or claim 7 dependent upon claim 1 or 2, characterised in that R_3 or R_4 or both are methylene groups.

9. Use of organophosphorus compounds according to one of claims 1 to 8 for the treatment of infectious processes in humans and animals which are caused by viruses, bacteria, fungi or parasites and as a fungicide, bactericide or herbicide in plants.

10. Use according to claim 9 for the treatment of infections caused by bacteria, viruses, fungi or uni- or multicellular parasites.

11. Use according to claim 10 for the treatment of infections which are caused by bacteria which are selected from the group which consists of bacteria of the family Propionibacteriaceae, in particular of the genus Propionibacterium, in particular the species Propionibacterium acnes, bacteria of the family Actinomycetaceae, in particular of the genus Actinomyces, bacteria of the genus Cornynebacterium, in particular the species Corynebacterium diphtheriae and Corynebacterium pseudotuberculosis, bacteria of the family Mycobacteriaceae, of the genus Mycobacterium, in particular the species Mycobacterium leprae, Mycobacterium tuberculosis, Mycobacterium bovis and Mycobacterium avium, bacteria of the family Chlamydiaceae, in particular the species Chlamydia trachomatis and Chlamydia psittaci, bacteria of the genus Listeria, in

particular the species Listeria monocytogenes, bacteria of the species Erysipelthrix rhusiopathiae, bacteria of the genus Clostridium, bacteria of the genus Yersinia, the species Yersinia pestis, Yersinia pseudotuberculosis, Yersinia enterocolitica and Yersinia ruckeri, bacteria of the family Mycoplasmataceae, of the genera Mycoplasma and Ureaplasma, in particular the species Mycoplasma pneumoniae, bacteria of the genus Brucella, bacteria of the genus Bordetella, bacteria of the family Neisseriaceae, in particular of the genera Neisseria and Moraxella, in particular the species Neisseria meningitides, Neisseria gonorrhoeae and Moraxella bovis, bacteria of the family Vibrionaceae, in particular of the genera Vibrio, Aeromonas, Plesiomonas and Photobacterium, in particular the species Vibrio cholerae, Vibrio anguillarum and Aeromonas salmonicidas, bacteria of the genus Campylobacter, in particular the species Campylobacter jejuni, Campylobacter coli and Campylobacter fetus, bacteria of the genus Helicobacter, in particular the species Helicobacter pylori, bacteria of the families Spirochaetaceae and Leptospiraceae, in particular of the genera Treponema, Borrelia and Leptospira, in particular Borrelia burgdorferi, bacteria of the genus Actinobacillus, bacteria of the family Legionellaceae, of the genus Legionella, bacteria of the family Rickettsiaceae and family Bartonellaceae, bacteria of the genera Nocardia and Rhodococcus, bacteria of the genus Dermatophilus, bacteria of the family Pseudomonadaceae, in particular of the genera Pseudomonas and Xanthomonas, bacteria of the family Enterobacteriaceae, in particular of the genera Escherichia, Klebsiella, Proteus, Providencia, Salmonella, Serratia and Shigella, bacteria of the family Pasteurellaceae, in particular of the genus Haemophilus, bacteria of the family Micrococcaceae, in particular of the genera Micrococcus and Staphylococcus, bacteria of the family Streptococcaceae, in particular of the genera Streptococcus and Enterococcus and bacteria of the family Bacillaceae, in particular of the genera Bacillus and Clostridium, and in the eradication of Helicobacter in ulcers of the gastrointestinal tract.

12. Use according to claim 10 for the treatment of infections which are caused by viruses which are selected from the group which consists of viruses of the genus Parvoviridae, in particular parvoviruses, dependoviruses, densoviruses, viruses of the genus Adenoviridae, in particular adenoviruses, mastadenoviruses, aviadenoviruses, viruses of the genus Papovaviridae, in particular papovaviruses, in particular papillomaviruses ("wart" viruses), polyomaviruses, in particular JC virus, BK virus and miopapovaviruses, viruses of the genus Herpesviridae in particular herpes simplex viruses, varicella-zoster viruses, human cytomegalovirus, Epstein-Barr viruses, human herpesvirus 6, human herpesvirus 7, human herpesvirus 8, viruses of the genus Poxiviridae, in particular poxviruses, orthopoxviruses, parapoxviruses, molluscum contagiosum virus, aviviruses, capriviruses, leporipoxviruses, primarily hepatotropic

viruses, in particular hepatitisviruses, such as hepatitis A viruses, hepatitis B viruses, hepatitis C viruses, hepatitis D viruses, hepatitis E viruses, hepatitis F viruses, hepatitis G viruses, hepadnaviruses, in particular all hepatitisviruses, such as hepatitis B virus, hepatitis D viruses, viruses of the genus Picornaviridae, in particular picornaviruses, all enteroviruses, all polioviruses, all coxsackie-viruses, all echoviruses, all rhinoviruses, hepatitis A virus, aphthoviruses, viruses of the genus Calciviridae, in particular hepatitis E viruses, viruses of the genus Reoviridae, in particular reoviruses, orbiviruses, rotaviruses, viruses of the genus Togaviridae, in particular togaviruses, alphaviruses, rubiviruses, pestiviruses, rubellavirus, viruses of the genus Flaviviridae, in particular flaviviruses, FSME virus, hepatitis C virus, viruses of the genus Orthomyxoviridae, in particular all influenza viruses, viruses of the genus Paramyxoviridae, in particular paramyxoviruses, morbillivirus, pneumovirus, measles virus, mumps virus, viruses of the genus Rhabdoviridae, in particular rhabdoviruses, rabies virus, lyssavirus, vascular stomatitisvirus, viruses of the genus Coronaviridae, in particular coronaviruses, viruses of the genus Bunyaviridae, in particular bunyaviruses, nairovirus, phlebovirus, uukuvirus, hantavirus, hantaan virus, viruses of the genus Arenaviridae, in particular arenaviruses, lymphocytic choriomeningitis virus, viruses of the genus Retroviridae, in particular retroviruses, all HTL viruses, human T-cell leukaemia virus, oncornaviruses, spumaviruses, lentiviruses, all HI viruses, viruses of the genus Filoviridae, in particular Marburg and Ebola virus, slow-viruses, ~~prions, on~~coviruses and leukaemia viruses.

13. Use according to claim 10 for the prevention and treatment of infections caused by unicellular parasites, namely the causative organisms of malaria, sleeping sickness, Chagas' disease, toxoplasmosis, amoebic dysentery, leishmaniases, trichomoniasis, pneumocystosis, balantidiasis, cryptosporidiosis, sarcocytosis, acanthamoebosis, naeglerosis, coccidiosis, giardiasis and lambliasis.

add B'